

**FURTHER DETAILS REGARDING MAIN TOPICS OF  
PROGRAMME NO. 04/2013 (Item No.14)  
ENGINEERING ASSISTANT GRADE.I  
KERALA STATE CONSTRUCTION CORPORATION LTD  
(SR FOR SC/ST) (CATEGORY NO. 168/2010)**

**1. STRUCTURAL ENGINEERING**

Static friction, mass moment of inertia, collision of elastic bodies, conservation of energy and momentum, simple harmonic motion, elastic constants. Rotational motion. Bending moment and shear force in statically determinate beams. Simple stress and strain relationship: Stress and strain in two dimensions, principal stresses, Mohr's circle. Strain energy, torsion and axial stress, close coiled helical springs, columns and struts, Euler and Rankine loads, deflections, arches, influence lines. Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Cylinders, thin walled pressure vessels, uniform torsion, buckling of column, combined and direct bending stresses. Flitched beams, slope deflection, trusses, concrete structures, balanced and unbalanced reinforcement, prestressed concrete, steel structures, rivets and joints.

**2. GEOTECHNICAL ENGINEERING**

Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships. Seepage forces, critical hydraulic gradient, permeability and compressibility of soils. Effective stress principle, liquefaction of soil, consolidation, compaction, shear strength. Mohr- Coulomb theory, active and passive earth pressures, settlement components.

**3. FOUNDATION ENGINEERING**

Sub-surface investigations- scope, drilling bore holes, sampling, penetration test, pile load test and plate load test. Earth pressure theories, effect of water table, layered soils. Stability of slopes-infinite slopes, finite slopes. Foundation types-foundation design requirements. Contact pressure distribution of ultimate bearing capacity of Terzaghi, design aspects of footings and rails. Shallow foundations-bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands & clays. Deep foundations pile types, dynamic & static formulae, load capacity of piles in sands & clays, bearing capacity of piles and pile groups, negative skin friction. Under-reamed piles, well foundation, machine foundation, modes of vibration, natural frequency, vibration isolation.

#### **4. FLUID MECHANICS AND IRRIGATION ENGINEERING**

Properties of fluids, principle of conservation of mass, momentum, energy and corresponding equations. Buoyancy, stability of floating and submerged bodies, streamlines, velocity potential and stream function. Applications of momentum and Bernoulli's equation, laminar and turbulent flow through pipes, friction factor, pipe networks. Energy loss, critical depth in open channel flow, hydraulic jump and its applications, flow net, equation of continuity. Concept of boundary layer and its growth, drag and lift on bodies. Uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump. Orifices and mouthpieces, notches and weirs. Dimensional analysis and hydraulic modeling, undistorted and distorted models. Hydrograph, unit hydrograph, specific yield, aquifers, storage capacity of reservoirs, reservoir losses, duty and delta, kharif and rabi crops, most efficient section of channels, types of dams, spillway, canal lining, hydraulic structures.

#### **5. ENVIRONMENTAL ENGINEERING**

Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards. Domestic wastewater treatment, quantity and characteristics of domestic wastewater, primary and secondary treatment. Unit operations and unit processes of domestic wastewater, sludge disposal. Principles of coagulation, flocculation and sedimentation, distribution systems, sewerage systems, sewage treatment, sanitation, filtration, B.O.D, C.O.D., DO, self purification of streams.

#### **6. TRANSPORTATION ENGINEERING**

Geometric design of highways, classification of roads, transition curves, super elevation, testing and specifications of paving materials, design of flexible and rigid pavements. Railways, permanent way, ballast, sleeper, fastenings, points and crossings, different types of turn-outs, cross-over. Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway capacity. Signs, signals and markings.

## 7. SURVEYING

Importance of surveying, principles and classifications, mapping concepts, coordinate system, map projections, measurements of distance and directions. Chain surveying, theodolite traversing, tacheometry. Plane table surveying, two-point problem, three-point problem. Compass surveying, bearing. Errors and adjustments, horizontal and vertical curves. Astronomical surveying, aerial photogrammetry, hydrographic surveying. Leveling, refraction and curvature corrections.

***NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.***